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## **Islam, the Greeks and the Scientific Revolution** **By Fjordman**

I have written a couple of essays regarding the Greek impact on the rise of modern science, and why the Scientific Revolution didn't happen in the Islamic world. I find this to be an interesting topic, especially since there are so many myths regarding this perpetrated by Muslims and their apologists today, so I will explore the subject in some detail.

I mentioned the ancient Egyptian hieroglyphs in one of my previous essays. It has been claimed by one researcher that an Arab alchemist in the ninth century managed to decode some of the hieroglyphs. Even if this should be true, his research didn't leave any lasting impact and wasn't followed up by others, which is in itself significant. The proven track record is that Arab Muslims had controlled Egypt for more than a thousand years, yet never managed to decipher the hieroglyphs nor for the most part displayed much interest in doing so. The trilingual Rosetta Stone was employed by the French philologist Jean-François Champollion to decipher the hieroglyphs in 1822. He chose an intuitive (though ultimately correct) approach by employing the Coptic language, the liturgical language of the Egyptian Christians (which was a direct descendant of that of the ancient Pharaohs, as opposed to the language of the Arab invaders) rather than the more mathematical approach of his English rival Thomas Young.

For the sake of historical accuracy, it should be mentioned that when hieroglyphs were finally put out of use, thus ending one of the oldest continuous cultural traditions on the planet, dating back at least to the Narmer Palette celebrating the unification of Upper and Lower Egypt in the 32nd century B.C., this was also done by Christians. The process was begun in the fourth century AD, before the partition of the Roman Empire, and was completed by the Eastern Roman (Byzantine) Emperor Justinian who abolished the worship of Isis on the island of Philae in the sixth century. As the Egyptian religion was shut down, so the writing system associated with it was forgotten. The remnants of Plato's Academy were also closed in the name of Christian (Nicaean) unity.

Justinian is otherwise remembered for constructing the Hagia Sophia, the grandest cathedral in Christendom for almost a thousand years, and for his ultimately unsuccessful attempts at restoring the unity of the Roman Empire by reconquering the Western lands. This stretched the resources of the Empire, and along with a plague pandemic, drained its strength. The long wars between the Byzantines and the Sassanid (Persian) Empire weakened both states and were one of the reasons why the Arabs could make their Islamic conquests in the seventh century.

Logically speaking, the Middle East should be perfectly situated to combine the knowledge of all major centers of civilization in the Old World, from the Mediterranean and the Greco-Roman world via the Persian and other pre-Islamic cultures in the Middle East to India and the civilizations of the Far East. As I will demonstrate, the Muslim thinkers and scientists whose names are worth mentioning did just that.

According to scholar F. R. Rosenthal: "Islamic rational scholarship, which we have mainly in mind when we speak of the greatness of Muslim civilisation, depends in its entirety on classical antiquity....in Islam as in every civilisation, what is really important is not the individual elements but the synthesis that combines them into a living organism of its own....Islamic civilisation as we know it would simply not have existed without the Greek heritage."

Greek thought was certainly an important inspiration for virtually all Muslim thinkers, but it wasn't the only one. Alkindus (Al-Kindi), the Arab mathematician who lived in Baghdad in the ninth century and was close to several Abbasid Caliphs, was one of the first to attempt reconciling Islam with Greek philosophy, especially Aristotle, a project that was to last for several centuries and prove ultimately unsuccessful. His other lasting impact was his writings about Indian arithmetic and numerals. Alkindus was one of a handful of people primarily responsible for spreading the knowledge and use of Indian numerals in the Middle East.

India has a long-standing mathematical tradition and the Hindu numerical system is one of its most important contributions to world culture. It was slowly introduced in Western Europe during the Middle Ages, gained momentum after the Italian mathematician Fibonacci in 1202 published his book *Liber Abaci* and reached wide acceptance during the Renaissance. Europeans learned about Indian numerals via Arabs, which is why they were mistakenly called Arabic numerals in the West. They were superior to Roman numerals in several ways, the revolutionary concept of zero being one of them. There is no doubt that this numerical system reached the West via the Islamic world, but we should remember that since the Middle East is situated between India and Europe, any ideas from India by necessity had to pass through that region to reach Europe. I'm not sure how much credit we should give Islam for this geographical accident.

Al-Razi was a talented Persian physician and chemist who lived in the ninth and early tenth century. He combined Greek, Indian and Persian traditions, and relied on clinical observance of patients in the Hippocratic tradition. He also commented, and criticized, the works of philosophers such as Aristotle. Some of his writings were translated into Latin. As Ibn Warraq writes in his book *Why I Am Not a Muslim*, "Perhaps the greatest freethinker in the whole of Islam was al-Razi, the Rhazes of Medieval Europe (or Razis of Chaucer), where his prestige and authority remained unchallenged until the seventeenth century. Meyerhof also calls him the 'greatest physician of the Islamic world and one of the great physicians of all time.'" He was also highly critical

of Islamic doctrines, and considered the Koran to be an assorted mixture of "absurd and inconsistent fables." Moreover, "His heretical writings, significantly, have not survived and were not widely read; nonetheless, they are witness to a remarkably tolerant culture and society - a tolerance lacking in other periods and places."

Avicenna (Ibn Sina) was a Persian physician who continued the course set by al-Razi of mixing Greek, Indian, East Asian and Middle Eastern medical learning. His book *The Canon of Medicine* from the early eleventh century was a standard medical text for centuries. A striking number of the Muslims who did leave some imprint upon the history of science were Persians, who could tap into their proud pre-Islamic heritage. Historian Ibn Khaldun admitted that "It is strange that most of the learned among the Muslims who have excelled in the religious or intellectual sciences are non-Arabs with rare exceptions."

It is also interesting to notice that virtually all freethinkers and rationalists within the Islamic world, such as Avicenna or Farabi, were at odds with Islamic orthodoxy and were frequently harassed for this. Whatever discoveries they made were more in spite of Islam than because of Islam, and in the end, Islam won. As Ibn Warraq notes, "orthodox Islam emerged victorious from the encounter with Greek philosophy. Islam rejected the idea that one could attain truth with unaided human reason and settled for the unreflective comforts of the putatively superior truth of divine revelation. Wherever one decides to place the date of this victory of orthodox Islam (perhaps in the ninth century with the conversion of al-Ashari, or in the eleventh century with the works of al-Ghazali), it has been, I believe, an unmitigated disaster for all Muslims, indeed all mankind."

Averroes (Ibn Rushd) was born in Córdoba, Spain (Andalusia) in the 12th century. He held comparatively progressive views on women, was in some ways a freethinker and faced trouble for this, yet he was also a jurist in the Maliki school of sharia law and served as a qadi, Islamic judge, in Seville. He supported the traditional view, held by leading scholars even into the twenty-first century, of the death penalty for persons leaving Islam: "An apostate...is to be executed by agreement in the case of a man, because of the words of the Prophet, 'Slay those who change their din [religion]'...Asking the apostate to repent was stipulated as a condition...prior to his execution."

Still, Averroes is chiefly remembered for his attempts at combining Aristotelian philosophy and Islam. According to Ibn Warraq, he had a profound influence on the Latin scientists of the thirteenth century, yet "had no influence at all on the development of Islamic philosophy. After his death, he was practically forgotten in the Islamic world."

Philosophy in general went into permanent decline. One of the reasons for this was the influential al-Ghazali, by many considered the most important Muslim after Muhammad himself, who argued that much of Greek philosophy was logically incoherent and an affront to Islam. Averroes' attempts at refuting al-Ghazali were ignored and forgotten.

The leading Jewish thinker of this era was the rabbi and physician Moses Maimonides. He was born in 1135 in Córdoba in Islamic-occupied Spain, but had to flee through North Africa when the devout Berber Almohades invaded from Morocco and attacked Christians and Jews in a classical Jihad fashion. Maimonides eagerly read Greek philosophy, some of which was available in Arabic. He also, for the most part, wrote in Arabic. His attempts at reconciling Aristotelian philosophy with the Torah influenced the great Christian thinker Saint Thomas Aquinas, who made similar efforts at reconciling Greek thought with biblical Scripture a few generations later.

It is true that some Greek and other classics were translated to Arabic, but it is equally true that Muslims could be highly particular about which texts to exclude. As Iranian intellectual Amir Taheri explains: "It is no accident that early Muslims translated numerous ancient Greek texts but never those related to political matters. The great Avicenna himself translated Aristotle's *Poetics*. But there was no translation of Aristotle's *Politics* in Persian until 1963."

In other words: There was a great deal of Greek thought that could never have been "transferred" to Europeans by Arabs, as is frequently claimed by Western Multiculturalists, because many Greek works had never been translated into Arabic in the first place. Muslims especially turned down political texts, since these included descriptions of systems in which men ruled themselves according to their own laws. This was considered blasphemous by Muslims, as laws are made by Allah and rule belongs to his representatives.

William of Moerbeke was a Flemish scholar and prolific translator who probably did more than any other individual for the transmission of Greek thought to the West. His translation of virtually all of the works of Aristotle and many by Archimedes, Hero of Alexandria and others paved the way for the Renaissance. He was fluent in Greek, and was for a time Catholic bishop of Corinth in Greece. He made highly accurate translations directly from the Greek originals, and even improved earlier, flawed translations of some works. His Latin translation of *Politics*, one of the important works that were not available in Arabic, was completed around 1260. His friend Thomas Aquinas used this translation as the basis for his groundbreaking work *The Summa Theologica*. Aquinas did refer to Maimonides as well as to Averroes and Avicenna and was familiar with their writing, but he was rather critical of Averroes and refuted some of his use of Aristotle.

Like Aquinas, William of Moerbeke was a friar of the Dominican order and had personal contacts at the top levels of the Vatican. Several texts, among them some of Archimedes, would have been lost without the efforts of Moerbeke and a few others, and he clearly did his work on behalf of the Roman Catholic Church. Moreover, one of the reasons why he did this was because the translations that were available in Arabic were incomplete and sometimes of poor linguistic quality. The Arabic translations, although they did serve as an early reintroduction for some Western Europeans to Greek thought, didn't "save" Greek knowledge as it had never been lost. It had been preserved in an unbroken line since Classical times by Greek, Byzantine Christians, who still considered themselves Romans, and it could be recovered there. There was extensive contact between Eastern and Western Christians at this time; sometimes amiable, sometimes less so and occasionally downright hostile, but contact nonetheless. The permanent recovery of Greek and Classical learning was undertaken as a direct transmission from Greek, Orthodox Christians to Western, Latin Christians. There were no Muslim middlemen involved.

As a result, by the late 1200s, Saint Thomas Aquinas and early Renaissance figures such as the poet Dante and the humanist Petrarch had at their disposal a much more complete and accurate body of Greek thought than any of the renowned Muslim philosophers ever did. What's more, many of the translations that did exist in Arabic had been undertaken by Christians in the first place, not by Muslims.

At the American Thinker, Dr. Jonathan David Carson dispels some of the hype regarding Islam's role in the history of science. In his view, "The 'Islamic scholars' who translated 'ancient Greece's natural philosophy' were a curious group of Muslims, since all or almost all of the translators<sup>1</sup> from Greek to Arabic were Christians or Jews." Moreover, most Greek texts "did not make the long journey from Greek to Syriac or Hebrew to Arabic to Latin, and Western Europeans preferred [surprise!] translations of Aristotle directly from the Greek, which were not only superior but also more readily available."

In A History of Philosophy, Frederick Copleston says that "it is a mistake to imagine that the Latin scholastics were entirely dependent upon translations from Arabic or even that translation from the Arabic always preceded translation from the Greek." Indeed, "translation from the Greek generally preceded translation from the Arabic." This view is confirmed by Peter Dronke in A History of Twelfth-Century Western Philosophy: "most of the works of Aristotle, however, were translated directly from the Greek, and only exceptionally by way of an Arabic intermediary...translations from the Arabic must be given their full importance, but not more."

As Carson sees it, "the great rescue of Greek philosophy by translation into Arabic turns out to mean no rescue of Plato and the transmission of Latin translations of Arabic translations of Greek texts of Aristotle, either directly or more often via Syriac or Hebrew, to a Christendom that already had the Greek texts and had already translated most of them into Latin."

Moreover, the intellectual curiosity was entirely one-sided. As Bernard Lewis states in The Muslim Discovery of Europe: "We know of no Muslim scholar or man of letters before the eighteenth century who sought to learn a western language, still less of any attempt to produce grammars, dictionaries, or other language tools. Translations are few and far between. Those that are known are works chosen for practical purposes and the translations are made by converts or non-Muslims." J.M. Roberts put it this way: "Why, until very recently, did Islamic scholars show no wish to translate Latin or western European texts into Arabic? (...) It is clear that an explanation of European inquisitiveness and adventurousness must lie deeper than economics, important though they may have been."

Much has been made of Spain's glorious Islamic past, yet more books are translated in Spain now in a single year than have been translated into Arabic over the past 1,000 years. As I have shown, what existed of advances in sciences in the early centuries of Islamic rule owed its existence almost entirely to the infusion of pre-Islamic thought, and even at the best of times the translations from non-Muslim ideas and books could be quite selective. Later, even the limited debate of Greek philosophy was curtailed. Muslims were assured of their God-given superiority and did not bother to look into ideas from worthless infidel cultures.

Toby E. Huff, author of the book The Rise of Early Modern Science: Islam, China and the West, explains this. A landmark in Western science was Nicholas Copernicus' The Revolutions of the Heavenly Spheres from 1543. The same years also saw another milestone in the rise of modern science: Vesalius' On the Fabric of the Human Body, which created the foundations for modern medicine by representing an empirical agenda, the first-hand examination of the body through human dissection (autopsy).

According to Huff, "Vesalius claimed to have corrected over 200 errors in Galen's account of human anatomy," and his "illustrations are far superior to anything to be found in the Arabic/Islamic tradition (where pictorial representation of the human body was particularly suspect) or, for that matter, in the Chinese and (I presume) Indian traditions." In astronomy, "Kepler went far beyond Ptolemy's methods, and discovered entirely new principles for the precise description of the motions of bodies in the heavens," thus proving the elliptical (and hence not perfectly circular) orbit of Mars.

In the eyes of Toby E. Huff, "the twelfth and thirteenth centuries witnessed a social, intellectual and legal revolution that laid the intellectual and institutional foundations upon which modern science was later constructed. At the heart of this development was the jurisprudential idea of a corporation, a collection of individuals who were recognized as a singular 'whole body' and granted legitimate legal autonomy. Such entities were given the right to sue and be sued, to buy and sell property, to make rules and laws regulating their activities, to adjudicate those laws and to operate according to the principle of election by consent as well as the Roman legal aphorism, what affects everyone should be considered and approved by everyone. Among the entities granted status as legitimate corporations were cities and towns, charitable organizations, professional guilds (especially of physicians) and, of course, universities. Nothing comparable to this kind of legal autonomy emerged in China or under Islam. In short, the European medievals created autonomous, self-governing institutions of higher learning and then imported into them a methodologically powerful and metaphysically rich cosmology that directly challenged and contradicted many aspects of the traditional Christian world-view."

This was also a time period noted for the growth of early modern capitalism, but Huff rejects any simplistic connection between money and science. Christian Europe exhibited an intellectual curiosity, a desire to uncover truth, that could not be reduced simply to a matter of economic interests: "There was indeed a 'commercial revolution' sweeping Europe from about the twelfth century, but that hardly explains the great interest in Aristotle in the universities of that period or the decision by medical practitioners to undertake dissections and to incorporate medical education into the university curriculum. Similarly, there was another rise in commercial activities in the sixteenth century, but this hardly explains either the motivation of the clerical Copernicus, or of Galileo, Kepler, or Tycho Brahe in developing a new astronomy against the interests of the Church."

One of the most groundbreaking innovations in Europe during the High Middle Ages was the creation of an ongoing,

university-centered debate. This made all the difference, since, as Huff points out, "it is one thing if an activity is pursued randomly by various actors; it is something else altogether if that activity is carried on collectively as a result of a regularized process." While Islamic madrasas excluded all of the natural works of Aristotle, as well as logic and natural theology, European scholars benefited from "a surprising degree of freedom of inquiry" which "did not exist in the Arab/Muslim world then and does not exist now."

Centers of learning have existed in civilizations throughout recorded history, yet most of them did not possess all of the qualities generally associated with a university today. It is possible that the Chinese, the Koreans, the Japanese, the Indians and others had institutions that could be called universities already at this early age; I don't know Asian history intimately enough to judge that. But the Islamic world definitely did not.

The German-Syrian reformist Bassam Tibi points out that the Muslim thinkers who developed Greek rationalism are today despised in their own civilization. As he writes in his book *Islam Between Culture and Politics*, "rational sciences were -- in medieval Islam -- considered to be 'foreign sciences' and at times heretical. At present, Islamic fundamentalists do not seem to know that rational sciences in Islam were based on what was termed *ulum al-qudama* (the sciences of the Ancients), that it, the Greeks."

Science was viewed as Islamic science, the study of the Koran, the hadith, Arab history etc. The Islamic madrasa was not concerned with a process of reason-based investigation or unrestrained enquiry but with a learning process in the sacral sense. Tibi believes it is thus incorrect to call institutions such as Al-Azhar in Cairo, Egypt, the highest institution of learning in Sunni Islam, a university: "Some Islamic historians wrongly translate the term madrasa as university. This is plainly incorrect: If we understand a university as *universitas litterarum*, or consider, without the bias of Eurocentrism, the cast of the *universitas magistrorum* of the thirteenth century in Paris, we are bound to recognise that the university as a seat for free and unrestrained enquiry based on reason, is a European innovation in the history of mankind."

It is noteworthy that the first medieval European universities were sometimes developed out of monasteries or religious schools. However, here the Greek knowledge was adopted in a far more unfettered manner than it was in the Middle East. The earliest European universities, such as the University of Bologna in Italy and Oxford in England, were created in the eleventh century. More were established during the twelfth and thirteenth centuries, for instance the University of Paris (Sorbonne), the University of Cambridge, the University of Salamanca in Spain and the University of Coimbra in Portugal.

According to Bassam Tibi, the situation has changed less than one might think: "In Muslim societies, where higher institutions of learning have a deeply rooted procedure of rote-learning, the content of positive sciences adopted from Europe is treated in a similar fashion. Verses of the Koran are learned by heart because they are infallible and not to be enquired into. Immanuel Kant's *Critiques* or David Hume's *Enquiry*, now available in Arabic translation, are learned by heart in a similar manner and not conceived of in terms of their nature as problem-oriented enquiries." As a result, "In contrast to the European and the US-model, students educated in a traditional Islamic institution of learning neither have a *Bildung* (general education) nor an *Ausbildung* (training)."

This is a problem members of this culture bring with them abroad if they move. In Denmark, Århus city council member Ali Nuur complained that one of the challenges certain immigrant groups face in the education system is that they are unfamiliar with tests rooted in a rational, critical and analytical way of thinking. Guess who?

Another issue is the lack of individual liberty. I still haven't read *Atlas Shrugged*, a novel I know many Americans hold in high regard, and I have mixed feelings about Ayn Rand's philosophies. However, one thing I do agree with her about is that "Civilization is the progress toward a society of privacy. The savage's whole existence is public, ruled by the laws of his tribe. Civilization is the process of setting man free from men." A Danish man who lived in Iran before the Revolution in 1979 noticed that if he suggested to his Muslim friends that he would like to enjoy some privacy for while, they thought he was crazy. The very notion of "privacy" was alien to them because it implies that you are an autonomous individual with needs of your own. A Muslim is simply an organic part of the *Umma*, the Islamic community. This lack of individualism and individual liberty is one of the main reasons why Muslims lost out to other cultures.

On the other hand, I believe the West has in recent decades gone too far in making individualism the sole basis of our culture. When a nation is reduced to nothing more than an atomized collection of individuals, with no ties to the past and no obligations to future generations, mounting a defense of a lasting society becomes difficult, if not impossible.

According to scholar Lynda Shaffer, "Francis Bacon (1561-1626), an early advocate of the empirical method, upon which the scientific revolution was based, attributed Western Europe's early modern take-off to three things in particular: printing, the compass, and gunpowder. Bacon had no idea where these things had come from, but historians now know that all three were invented in China. Since, unlike Europe, China did not take off onto a path leading from the scientific to the Industrial Revolution, some historians are now asking why these inventions were so revolutionary in Western Europe and, apparently, so unrevolutionary in China."

The Song dynasty, from the tenth to the thirteenth century, was arguably the most dynamic period in Chinese history. Although printing "was invented by Buddhist monks in China, and at first benefited Buddhism, by the middle of the tenth century printers were turning out innumerable copies of the classical Confucian corpus."

According to Shaffer, "The origin of the civil service examination system in China can be traced back to the Han dynasty, but in the Song dynasty government-administered examinations became the most important route to political power in China. For almost a thousand years (except the early period of Mongol rule), China was governed by men who had come to power simply

because they had done exceedingly well in examinations on the Neo-Confucian canon. At any one time thousands of students were studying for the exams, and thousands of inexpensive books were required. Without printing, such a system would not have been possible."

As she explains, "China developed the world's largest and most technologically sophisticated merchant marine and navy." The Chinese "could have made the arduous journey around the tip of Africa and sail into Portuguese ports; however, they had no reason to do so. Although the Western European economy was prospering, it offered nothing that China could not acquire much closer to home at much less cost."

In contrast, the Portuguese, the Spanish and other Europeans were trying to reach the Spice Islands, what is now Indonesia. "It was this spice market that lured Columbus westward from Spain and drew Vasco da Gama around Africa and across the Indian Ocean." In Shaffer's view, technologies such as gunpowder and the compass had a different impact in China than they had in Europe, and it is "unfair to ask why the

Chinese did not accidentally bump into the Western Hemisphere while sailing east across the Pacific to find the wool markets of Spain."

Yes, Asia was the most prosperous region on the planet at this time. Europeans embarked on their Age of Exploration of the seas precisely out of a desire to reach the wealthy Asian lands (and bypass Muslim middlemen), which is why Christopher Columbus and his men mistakenly believed they had arrived in India when they reached the Americas. Asians did not possess a similar desire to reach Europe. But this still doesn't explain why the Chinese didn't embark on the final and most crucial stage of the Industrial Revolution in the West: Harnessing the force of steam and the use of fossil fuels to build stronger, more efficient machinery, faster ships and eventually railways, cars and airplanes.

Printing and literacy greatly expanded during Song times; the world's first printed paper money (bank notes) was introduced and a system of canals and roads was built, all facilitating an unprecedented population growth. Iron smelting and the use of coal multiplied several times over as China reached a stage sometimes called "proto-industrial." And yet China produced no Thomas Savery, Thomas Newcomen or James Watt to develop successful steam engines, nor a George Stephenson to build railway lines or a Karl Benz to make the first gasoline-powered automobile. Although experiments with flying had been undertaken in many nations around the world, the airplane was made possible only with the invention of modern engines, which is why China didn't produce the Wright brothers.

For thousands of years, human beings were limited by their ability to harness muscle power, of men and animals. This was later supplemented with windmills, watermills and similar inventions, which could be important, but in a limited fashion. The harnessing of steam power for engines and machinery was a revolution which provided the basis for enormous improvements in output and efficiency. For some reason, China never did take this final step, and although the country remained prosperous for centuries, later dynasties never quite matched the dynamism under Song times. Emphasis was on cultural continuity, and China experienced no great cultural flowering or event similar to the Renaissance, the Reformation and the Enlightenment in Europe. China was in its own eyes the Middle Kingdom. It had some annoying barbarians at its frontiers, but no immediate neighbors to rival its size and power, and thus little incentive for improvement. The result was relative (though not necessarily absolute) scientific stagnation. China could afford to grow self-satisfied, and she did. In contrast, Europeans, who were divided into numerous smaller states in a constant state of rivalry instead of one, large unified state, had stronger incentives for innovation, including in weapons technology.

The Mongol invasion, which ended the Song dynasty, is sometimes blamed for this loss of impetus. After the conquest of Beijing in 1215 the soil was greasy with human fat for months. According to Genghis Khan, "The greatest pleasure is to vanquish your enemies and chase them before you, to rob them of their wealth and see those dear to them bathed in tears, to ride their horses and clasp to your bosom their wives and daughters." He believed in practicing what you preach. DNA studies indicate that he may have as many as 16 million descendants living today.

The Mongols were notorious for their brutality, but they had a particular dislike for Muslims. Hulagu Khan led the Mongol forces as they completely destroyed Baghdad in 1258, thus ending what remained of the Abbasid Caliphate. The Christian community was largely spared, allegedly thanks to the intercession of Hulagu's Nestorian Christian wife.

The irony is that many Mongols soon adopted Islam as their preferred creed. Maybe the warlike nature of this religion appealed to them. It is possible to make a comparison between Muhammad and Genghis Khan. Temjin, who gained the title Khan when he founded the Mongol Empire in 1206, did believe he had received a divine mandate to conquer the world, and he created an impressive military force out of nothing by uniting scattered tribes and directing their aggressive energies outwards. He created a Mongolian nation where no nation had existed before, similar to what Muhammad did with the Arabs. The difference is that the Mongols didn't establish a religion of their own throughout their empire which outlasted their rule. We should probably be grateful for that, otherwise the Organization of the Mongolian Conference would be the largest voting bloc at the United Nations today, our schools would teach us about the glories of Mongol science and tolerance and our media would constantly warn us against the dangers of Genghisophobia.

In Europe, the Mongol conquests had the most lasting impact in the Ukraine and Russia. The city of Kiev was devastated while a new Russian state slowly grew out of Moscow. Ivan the Great in the 1400s expanded the Russian state and defeated the Tatar yoke, as the now Islamized Turko-Mongols of the Golden Horde were called. The Mongols invaded Eastern Europe and in the course of a few years attacked Hungary, Poland, Lithuania, Bulgaria and Serbia. They had reached as far as Vienna in 1241 when the Great Khan suddenly died and the commanders had to return to elect a new leader.

The Black Death, the great Eurasian plague pandemic, swept from Central Asia along the Silk Road through the Mongol Empire, reaching the Mediterranean and the Middle East in the 1340s. The disease, which killed at least a third of the population and more than 70% in some regions, probably reached Europe after the Golden Horde used biological warfare during a siege of the Black Sea port of Caffa, catapulting plague-infested corpses into the city. It was then carried to the European continent with fleeing Genoese traders. The Mongols thus didn't invade Western Europe, but at least they gave us the plague.

Many historians place great macrohistorical importance on the Mongol conquest. It certainly had a disruptive impact, and the trail of devastation it left behind severely depopulated regions from China and Korea via Iran and Iraq to Eastern Europe. It ended the dynamic Song dynasty, yet even before the Mongol conquest, there were few indications that a development towards modern machinery was about to take place in China. Japan, which has always learned a lot from China, escaped unscathed. A series of typhoons, dubbed kamikaze or "divine wind" by the Japanese, saved the country from the Mongol fleets in 1274 and 1281, but they, too, didn't develop a fully fledged industry until they adopted a Western model during the Meiji Restoration in the late nineteenth century.

Moreover, even if Western Europe escaped the Mongols, we should remember that Western Europeans had recently experienced centuries of political disintegration and population decline, longer than in any period in Chinese history for several thousand years. Europe also had to face a much more prolonged assault by Islam. Belgian scholar Henri Pirenne in his work *Mohammed and Charlemagne* asserted that the definitive break between the Classical world and the Middle Ages in the West was not the downfall of the Western Roman Empire following the partition in 395, but the Islamic conquests in the seventh century.

In Pirenne's view, although the Germanic tribes caused imperial authority to collapse in the fifth century, Western Europe was not totally cut off from the Eastern Roman Empire. The Mediterranean, *Mare Nostrum* or "Our Sea" as the Romans called it, still remained a Christian lake. This changed decisively during the seventh century when North Africa came under Islamic rule, as did the Iberian Peninsula. Although the Arab conquest was halted by the forces of Charles Martel at the Battle of Tours in France in 732, arguably the most important battle in Western history, Islamic attacks continued for centuries since Jihad is a permanent obligation and should be carried out on regular intervals. Jihad piracy, slave trade and looting across the Mediterranean accompanied by inland raids, occasionally as far north as the Alps in Switzerland, made normal communication between the Christian West and the Christian East extremely difficult. In fact, Jihad piracy and slavery from North Africa remained a serious threat to Europeans for more than a thousand years, even into the nineteenth century. As historian Ibn Khaldun, a devout Muslim and therefore anti-Christian, proclaimed: "The Christian could no longer float a plank upon the sea."

This was certainly true in the West, though the Byzantines still held their ground in the Aegean Sea. The Eastern Roman Empire was attacked by Arab Muslims in the 630s and quickly lost Syria, Palestine and Egypt, but managed to survive. Only a few years earlier the official language had been changed from Latin to Greek. It is custom to call the remaining, smaller and Hellenized state the Byzantine Empire.

The Carolingian Empire, named after Charles Martel (*Carolus* in Latin), was the "scaffold of the Middle Ages." Although it didn't survive for long, the structures put in place by Charles Martel and his grandson Charlemagne were to shape Western Europe for centuries. While civilization in Europe had always been centered on the Mediterranean, the center of power in the West was now north of the Alps. The Carolingian capital was established in Aachen in present-day Germany, as Muslims made access to the sea difficult. Charlemagne held his imperial coronation by Pope Leo III in Saint Peter's Basilica in the year 800, yet already in the year 846 Muslims sacked Rome and stole every piece of gold and silver in Saint Peter's. Arabs also occupied Sicily for several centuries, and attacked Naples, Capua, Calabria and Sardinia repeatedly. As Pirenne says, "the coast from the Gulf of Lyons and the Riviera to the mouth of the Tiber, ravaged by war and the pirates, whom the Christians, having no fleet, were powerless to resist, was now merely a solitude and a prey to piracy. The ports and the cities were deserted. The link with the Orient was severed, and there was no communication with the Saracen [Muslim] coasts. There was nothing but death. The Carolingian Empire presented the most striking contrast with the Byzantine. It was purely an inland power, for it had no outlets. The Mediterranean territories, formerly the most active portions of the Empire, which supported the life of the whole, were now the poorest, the most desolate, the most constantly menaced. For the first time in history the axis of Occidental civilization was displaced towards the North, and for many centuries it remained between the Seine and the Rhine. And the Germanic peoples, which had hitherto played only the negative part of destroyers, were now called upon to play a positive part in the reconstruction of European civilization."

Pirenne's thesis has been debated for generations, and new archaeological evidence has been uncovered since it was published in the 1930s. I personally think he underestimated the extent to which civilization collapsed in the West after the Germanic raids, but he is right that the Mediterranean was still open for communication, and that this changed dramatically after the Arab conquest. Though contacts between the Byzantines and Western Europe were limited during this time period, we should remember that they were never zero. Findings from Viking graves indicate that there was trade between the Baltic Sea and Constantinople even at this point, but trade was greatly diminished compared to what it had been previously.

The reason why the Christian West for centuries didn't have easy access to the Classical learning of the Christian East was because Muslims and Jihad had made the Mediterranean unsafe. It has to be the height of absurdity to block access to something and then take credit for transmitting it, yet that is precisely what Arabs do. As stronger states slowly grew up in the West, regular contact with their Eastern cousins was gradually re-established, starting with the Italian city-states. And as soon as direct contact was established, Western Europeans gained access to the original Greco-Roman manuscripts preserved in Constantinople. They didn't need to rely on limited translations in Arabic, which were anyway made from the same Byzantine manuscripts in the first place, and frequently by Christians. Moreover, Muslims have spent more than one thousand years systematically wiping out Greek culture in the Mediterranean region, a process which continues at Cyprus even into the

twenty-first century, which makes it patently ridiculous when they now brag about how much we owe them for their efforts at "preserving the Greek heritage." The efforts of Arabs are, in my view, as overrated as those by the Byzantine Empire are underrated.

John Argyropoulos, who was born in 1415 in Constantinople and died in 1487 in Italy, was a Byzantine expert on Greek history who played an important role in the revival of Classical learning in the West. He lectured at the universities of Florence and Rome. Among his students was Lorenzo the Magnificent from the influential Medici family, who sponsored Leonardo da Vinci, Michelangelo and others. Sandro Botticelli was working under the patronage of the Medicis when he in the 1480s painted *The Birth of Venus*. Pagan motifs inspired by the mythology of ancient Greece and Rome were widely popular at this time. Apparently, Leonardo da Vinci, too, attended the lectures of Argyropoulos. The universal genius was passionately interested in Classical learning, perhaps especially in science and mechanical engineering, a field in which he created numerous inventions. He was certainly familiar with the *Ten Books on Architecture* by the Roman engineer Vitruvius, the only major work on architecture and technology to survive from the Greco-Roman world, which was also a vital inspiration for Renaissance architects Brunelleschi and Alberti. Leonardo's famous drawing the *Vitruvian Man* was inspired by Vitruvius' writings about architecture and its relations to the proportions of the human body.

In the words of Deno Geanakoplos, Professor of Byzantine History, "We know that until the ninth century the patron saint of Venice was not Mark but the Greek Theodore, and that in the eleventh century Byzantine workmen were summoned by the Doge in order to embellish, perhaps entirely to construct, the church of St. Mark. Venetian-Byzantine contacts became more frequent in the twelfth century as a result of the growth of the large Venetian commercial colony in Constantinople." These contacts continued to grow during the High Middle Ages and into the Renaissance, and "In the half century or so before Constantinople's fall in 1453, a gradually increasing number of refugees from the East poured into the West. Venice, as lord of important territories in the Greek East, especially the island of Crete, and as the chief port of debarkation in Italy, received the major part of these refugees. This stream quickened rapidly after 1453."

He stresses that it is a mistake to believe that all Greek texts were transported out after the fall of Constantinople. Most of the refugees fleeing the Turkish Jihad could carry few possessions with them. The process of transferring Classical knowledge to the West took generations, even centuries, but was now greatly aided by Johannes Gutenberg's movable type printing press, introduced around the year 1450 in Mainz, Germany.

It was a major stroke of historical luck - a religious person would probably say divine providence - that printing was reinvented in Europe at exactly the same time as the last vestige of the ancient Roman Empire fell to Muslims. The texts that had been preserved by the Byzantines for a thousand years after Rome collapsed could now be rescued forever instead of quietly disappearing. This ensured that the Renaissance marked a permanent infusion of Greco-Roman knowledge into Western thought, not just a temporary one.

As historian Elizabeth L. Eisenstein says in her celebrated book *The Printing Press as an Agent of Change*: "The classical editions, dictionaries, grammar and reference guides issued from print shops made it possible to achieve an unprecedented mastery of Alexandrian learning even while laying the basis for a new kind of permanent Greek revival in the West. (...) We now tend to take for granted that the study of Greek would continue to flourish after the main Greek manuscript centers had fallen into alien hands and hence fail to appreciate how remarkable it was to find that Homer and Plato had not been buried anew but had, on the contrary, been disinterred forever more. Surely Ottoman advances would have been catastrophic before the advent of printing. Texts and scholars scattered in nearby regions might have prolonged the study of Greek but only in a temporary way."

According to Deno Geanakoplos, in the late fifteenth century "only one city in Italy, Venice, could fulfil all the complex requirements of a Greek press. Venice possessed a class sufficiently wealthy to buy, and the leisure to read, the printed classics. Venice was less subject to papal pressures than other Italian cities. Important too in [printer] Aldus' thinking must have been Venetian possession of the precious collection of Greek manuscripts bequeathed by Bessarion - manuscripts which could serve as paradigms for his books. And hardly less significant for him must have been the presence in Venice of a large, thriving Greek community. (.) By the time of Aldus' death in 1515, his press had given to the world practically all the major Greek authors of classical antiquity."

Historian Bernard Lewis writes in his book *What Went Wrong?*: "In the vast bibliography of works translated in the Middle Ages from Greek into Arabic, we find no poets, no dramatists, not even historians. These were not useful and they were of no interest; they did not figure in the translation programs. This was clearly a cultural rejection: you take what is useful from the infidel; but you don't need to look at his absurd ideas or to try and understand his inferior literature, or to study his meaningless history."

Muslims who wanted translations of Greek or other non-Islamic works were primarily concerned with topics of medicine, astronomy, mathematics, and philosophy. As Lewis says, they usually ignored playwrights and dramatists such as Sophocles and Euripides, historians such as Thucydides and Herodotus and poets such as Homer. This entire corpus of literature could only be saved from the Greek originals preserved in Constantinople. Moreover, in addition to being selective about Greek works, Muslims showed little interest in Latin writers, for instance Cicero. There was thus a large body of Greco-Roman learning and valuable literature that was never available in Arabic in the first place.

It is true that a number of Greek works were translated to Arabic, especially in the ninth century when a group called *Mu'tazilites* attempted, without lasting success, to reconcile Islamic with logic. As Ibn Warraq writes about them:

"However, it is clear now that the *Mu'tazilites* were first and foremost Muslims, living in the circle of Islamic ideas, and were

motivated by religious concerns. There was no sign of absolute liberated thinking, or a desire, as [Hungarian orientalist] Goldziher put it, 'to throw off chafing shackles, to the detriment of the rigorously orthodox view of life.' Furthermore, far from being 'liberal,' they turned out to be exceedingly intolerant, and were involved in the Mihna, the Muslim Inquisition under the Abbasids. However, the Mu'tazilites are important for having introduced Greek philosophical ideas into the discussion of Islamic dogmas."

According to writer Patrick Poole, "Western Christianity's rational tradition developed in the Medieval era precisely as a result of the outright rejection of the irrationalism inherent in Islamic philosophy, not the embracing of it." As he states, "a rationalist philosophy had begun to develop under the Mu'tazilite school of interpretation, which advocated for a created, as opposed to an uncreated, Quran. But Caliph al-Mutawakkil [reign 847-861] condemned the Mu'tazilite school, which opened the door for the rival Ash'arite interpretation, founded by al-Ash'ari (d. 935), to eventually take preeminence within Sunni Islam." Rationalism also faced an uphill battle because of the view of Allah as an

unpredictable and whimsical deity, since "only Allah truly acts with real effect; all seemingly natural observances of causation are merely manifestations of Allah's habits, for Allah simultaneously creates both the cause and the effect according to his arbitrary will. This view is best expressed by one of the Islamic philosophers cited by [Tariq] Ramadan, al-Ghazali (1059-1111), in his book, *The Incoherence of the Philosophers*."

The Koran is, structurally speaking, deeply inconsistent and almost incomprehensible to an average reader. One verse says one thing, the next verse contradicts this. The notion that Allah as incomprehensible and provides no correlation between cause and effect had a serious impact on the development of empirical sciences in the Islamic world. In contrast, for Jews and Christians, God has created the universe according to a certain logic, which can be described and predicted. Kepler firmly believed the solar system was created according to God's plan, which he attempted to unlock. Sir Isaac Newton was passionately interested in religion and wrote extensively about it. Even Albert Einstein, who was certainly not an orthodox, religious Jew, still retained some residue of the idea that the universe was created according to a logic which is, to a certain extent, comprehensible and accessible to human reason: "I believe in Spinoza's God, Who reveals Himself in the lawful harmony of the world, not in a God Who concerns Himself with the fate and the doings of mankind."

The Caliph al-Ma'mun (reign 813 - 833), who was influenced by the Mu'tazilite movement, created the House of Wisdom, a library and translation office. The Baghdad-centered Abbasid dynasty, which replaced the Damascus-centered Umayyad dynasty in 750, was closer to Persian culture and was probably inspired by the Sassanid practice of translating works and creating great libraries. Alkindus (Al-Kindi) was appointed to participate in the undertaking. Philosophical and scientific texts were translated into Arabic from Persian and Indian (Sanskrit) sources, but above all from Greek ones. Great efforts were made to collect and buy important Greek works and manuscripts from the Byzantines and have them translated.

In the book *How Greek Science Passed to the Arabs*, De Lacy O'Leary states that "Aristotelian study proper began with Abu Yusuf Ya'qub ibn Ishaq al-Kindi (d. after 873), commonly known as 'the Philosopher of the Arabs.' It is significant that almost all the great scientists and philosophers of the Arabs were classed as Aristotelians tracing their intellectual descent from al-Kindi and al-Farabi."

At the heart of these efforts was a Nestorian (Assyrian) Christian named Johannitius (Hunayn ibn Ishaq). He had studied Greek by living in Greek lands, presumably in the Byzantine Empire, and was put in charge of translations at the House of Wisdom. Soon, he, his son and his nephew had made available in Arabic and Syriac Galen's medical treatises as well as Hippocrates and texts by Aristotle, Plato and others. In some cases, he apparently translated a work into Syriac and his son Ishaq translated this further into Arabic. All senior medical doctors in the Islamic world, including Avicenna and Rhazes, were later influenced by these translations of Greek medicine.

In 431 Nestorius, a Christian Patriarch, was expelled from Constantinople for heresy. The so-called Assyrian Church of the East thus split from the Byzantine Church. Their followers found a new home in the Syriac-speaking world and were welcomed in the Sassanid Persian Empire, the rival of Byzantium. They brought with them a collection of Greek texts, among them medical works of Galen and Hippocrates. It was these texts, aided by other manuscripts acquired and bought from Constantinople later, which provided the basis for translations of Greek texts into Arabic. The followers of this Eastern church, usually called Nestorians in the West, had communities spread out across much of Iraq, Iran and Central Asia, and were respected for their medical skills.

According to scholar Thomas T. Allsen, "Nestorians in the East were closely associated with the medical profession. A considerable body of Syriac medical literature, some in the original and some in translation, has been recovered in central Asia. This is hardly surprising, because Eastern Christians were an important fixture in West Asian medicine." Western medicine in Yuan (Mongol ruled) China, often characterized as "Muslim," was almost always in the hands of Nestorians, a situation that Western travelers found worthy of note.

Syriac is a dialect of Aramaic, the language spoken by Jesus. It was once the lingua franca of the Middle East and was widely used among Christians and also Arabs and to some extent Persians. It had a major impact on the development of Arabic, which later replaced it following the Islamic conquests. The Nabataeans, a Semitic people associated with the famous rock city of Petra close to the Dead Sea in present-day Jordan, were greatly influenced by Aramaic, and the Arabic alphabet developed out of their alphabet. The most unorthodox scholars even suggest that the Islamic religion itself may have developed closer to this region, at the northern fringes of Arabia, than around Mecca in central Arabia.

Some researchers believe that Syriac, or Syro-Aramaic, was also the root of the Koran. When it was composed, Arabic was not fully developed as a written language. Syriac, however, was widely used in the region at the time. Ibn Warraq estimates that up



to 20% of the Koran is incomprehensible even to educated Arabs because segments of it were originally written in another, related language before Muhammad was born. A German professor of ancient Semitic and Arabic languages writes about the subject under the pseudonym Christoph Luxenberg. If you believe Luxenberg, the chapters or suras of the Koran usually ascribed to the Mecca period, which are also the most tolerant and non-violent ones as opposed to the much harsher and more violent chapters from Medina, are not "Islamic" at all, but Christian:

"In its origin, the Koran is a Syro-Aramaic liturgical book, with hymns and extracts from Scriptures which might have been used in sacred Christian services. (.) Its socio-political sections, which are not especially related to the original Koran, were added later in Medina. At its beginning, the Koran was not conceived as the foundation of a new religion. It presupposes belief in the Scriptures, and thus functioned merely as an inroad into Arabic society."

Monte Cassino is a monastery in southern Italy, founded by Saint Benedict in the sixth century, which was sacked and burned and its monks killed in 883 by Arabs in one of their countless Jihad raids in Western Europe. It was later rebuilt, and from here the monk Constantine the African in the eleventh century translated medical texts from Arabic into Latin, including those of Hippocrates and Galen done by Johannitius in Baghdad. Constantine also translated medical treatises written in Arabic by the Egyptian Jew Isaac Israeli ben Solomon. He was influenced by Hippocrates, Galen, Aristotle and Plato.

It is easy to track how Arabic translations of Greek texts from Byzantine manuscripts, often done by Christians, made their way from the Islamic East and ended up in the Iberian Peninsula in the Islamic West, where some of them were translated by Christians, for instance in the multilingual city of Toledo in central Spain, back to Latin. It is thus true that some Greek texts were reintroduced in the West via Arabic, sometimes passing via Syriac or Hebrew along the way, but this was always based, in the end, on manuscripts from the Byzantine Empire.

The work led by Johannitius in Baghdad preserved via the Arabic translation some of Galen's works lost in the Greek original. The Greek physician Galen worked in the second century A.D., systematized medical knowledge in the Greco-Roman world and supplied this with his own research. He lamented the fact that he couldn't perform dissection of human corpses, but this wasn't allowed during Roman times so he based his studies of human anatomy on dissections of animals such as dogs, apes and pigs. This is funny if you are familiar with the low status dogs, apes and pigs have in Islam, and know that all subsequent medicine in the Muslim world was inspired by Galen. Since dissection of human corpses was taboo in the Islamic world, too, Galen's errors remained unchallenged for centuries, until the Renaissance in Christian Europe. Leonardo da Vinci made numerous accurate anatomical drawings but didn't share this knowledge much at his time. The final breakthrough came with the anatomist Andreas Vesalius from Brussels, who published his book *On the Workings of the Human Body* in 1543 based on observation through autopsy. He is considered the father of modern anatomy in the Western world.

The great British expert on Chinese science history Joseph Needham has written about how the "four great inventions of China," the compass, printing, papermaking and gunpowder, were exported to the rest of the world. Although Needham is good at writing about technology, he doesn't always provide sufficient evidence of transmission for these inventions. Only one of them, paper, can be said with absolute certainty to have reached the West as a fully developed product. According to Professor T.F. Carter, "Back of the invention of printing lies the use of paper, which is the most certain and the most complete of China's inventions."

As Lucien Febvre and Henri-Jean Martin write in *The Coming of the Book*, "It would have been impossible to invent printing had it not been for the impetus given by paper, which had arrived in Europe from China via the Arabs two centuries earlier and came into general use by the late 14th century." In the period from 1450 to 1550, Europe was becoming covered with paper mills. The traditional parchment was expensive and not well suited for mass production.

During the Protestant Reformation in the sixteenth century, the reformers wanted the Bible to be available in the common language, not in Latin. Martin Luther thus helped shape the modern German language. As scholar Irving Fang states in the book *A History of Mass Communication*, "Vernacular printing also led French readers to think of themselves as being part of France, and English readers to regard themselves as part of England."

In some ways, we are witnessing a reversal of this trend towards nationalization now with global communications and the rise of English as an international lingua franca. Febvre and Martin believe, though, that about 77% of the books printed before 1500 were still in Latin, with religious books still predominant. This gradually gave way to secular books and other languages, but "it was not until the late 17th century that Latin was finally overthrown and replaced by the other national languages and by French as the natural language of philosophy, science and diplomacy. Every educated European then had to know French." They estimate that about 20 million books were printed in Europe before the year 1500, and that "between 150-200 million copies were published in the 16th century. This is a conservative estimate and probably well below the actual figure." This is even more impressive if we remember that Europe of that day was far less populous than it is now and that only a minority could read. There was obviously a change then, and a swift one, compared to the slow, expensive and sometimes inaccurate process of copying each individual book by hand.

Printing did have a major impact in East Asia, but it didn't trigger quite the same revolution as it did in the West. Buddhism came to Japan via China and Korea, and Buddhist monks also brought with them, in addition to tea and thus the basis for the elaborate Japanese tea ceremonies, other aspects of Chinese civilization, among them printing in the eighth century. Yet until the late sixteenth century the Japanese printed only Buddhist scriptures. Europe also benefited from having a more diverse book trade than China and from having more competition in general.

As Irving Fang states, "Printing had not disturbed the monolithic Chinese empire. The introduction of printing in mid-fifteenth century Europe might also have made little headway if Europe were not ripe for change." According to him, the "establishment

of European universities from the twelfth century onward marked the end of the 700-year-old Monastic Age. The more secular age that followed saw the emergence of a literate middle class and a rising demand for books of all kinds."

Movable type printing had been invented in China by Bi Sheng around 1040, but it never gained widespread popularity. The nature of the Chinese language with its nonalphabetic script presumably didn't help. To solve this dilemma, in the first half of the 1400s the Korean King Sejong the Great encouraged book production and ordered his scholars to create an alphabet for the common people as opposed to the complicated Chinese script with its thousands of characters. They produced hangul, "Korean letters," a phonetic system inspired by other alphabetic scripts, among them Sanskrit.

Movable type printing with metal types and an alphabetic script was thus in use in Korea before Gutenberg began printing Bibles in Germany, but there are no indications of a connection between what happened in Korea and what happened in Europe. The geographical distance is too big and the time difference too small to make such a connection likely. The Chinese used baked clay for their characters, and only started employing metal types after their use in Europe. Gutenberg was a goldsmith and naturally created his letters out of metal.

According to Fang, "What Gutenberg produced that did not exist in Asia was a printing system. Most obvious among its elements were controlled, exact dimensions of alphabet type cast from metal punches made of hardened steel. These were not unlike the dies, stamps, and punches that were well known to European leather workers, metalsmiths, and pewter makers."

Although possible, no link between the Eastern and the Western printing traditions has ever been conclusively proven. The different nature of the systems involved has caused many historians to believe that printing was developed in Europe independently of Asia. In contrast, we know with 100% certainty that Muslims were familiar with East Asian printing. The Mongols left a trail of devastation across much of Eurasia in the 1200s, but their vast empire did open up unprecedented opportunities for cultural exchange. As scholar Thomas T. Allsen shows, however, being exposed to foreign ideas doesn't necessarily mean that you will adopt them. Local scholars often clung to the inherited tradition. He uses Russia at the time of Peter the Great as an example where some elements of that society were fanatically opposed to all innovation while others enthusiastically embraced all things foreign. Allsen has described how the authorities in Iran under Mongolian rule in 1294 attempted to introduce Chinese-style printed banknotes, but failed, despite severe threats, due to massive popular resistance:

"Certainly the Muslim world exhibited an active and sustained opposition to movable type technologies emanating from Europe in the fifteenth century and later. This opposition, based on social, religious, and political considerations, lasted well into the eighteenth century. Only then were presses of European origin introduced into the Ottoman Empire and only in the next century did printing become widespread in the Arab world and Iran. This long-term reluctance, the disinterest in European typography, and the failure to exploit the indigenous printing traditions of Egypt certainly argue for some kind of fundamental structural or ideological antipathy to this particular technology."

I am definitely not a believer in technological determinism, but some technologies do have a greater impact than others. One of the most important inventions ever made has to be printing. Surely it is no coincidence that the Scientific Revolution decisively took off in Europe after the introduction of printing, just as it is not a coincidence that the one civilization that came closest to a similar breakthrough, China, was the one where printing had first been invented. It is likely that the rejection of printing alone set the Islamic world back centuries vis-...-vis non-Muslims.

As David Crowley and Paul Heyer write in *Communication in History: Technology, Culture, and Society*, "Traditionally, the view has been that printing, along with numerous other developments, marked the transition between the end of the Middle Ages and the dawn of the modern era. However, the more we study this remarkable invention, the more we realize that it was not just one factor among many. Although we hesitate to argue for historical 'prime-movers,' certainly the printing press comes close to what is meant by this term. It was a technology that influenced other technologies - a prototype for mass production - and one that impacted directly on the world of ideas by making knowledge widely available, thereby creating a space in which new forms of expression could flourish. The repercussions of the printing press in early modern Europe did not come about in an inherently deterministic manner. Rather, they resulted from the existence of conditions whereby print could enhance a context receptive to its potential."

The spread of printing in East Asia was intimately connected to the Buddhist religion, just as it was used in Europe to print Bibles. Yet while Buddhists, Christians and Jews eagerly embraced this new technology, Muslims stubbornly rejected it. The contrast is striking if we compare this to how eagerly Muslims embraced another Chinese invention: gunpowder. Gunpowder wasn't the first chemical substance used in warfare.

According to legend, "Greek fire," a feared weapon in its time, was invented in the seventh century by Callinicus, a refugee from the Arab conquest of Syria. It was successfully used to defeat sieges by Arab Muslims of Constantinople in 674 and in 718, and helped the Byzantine Empire to survive for as long as it did. Its qualities appear to be somewhat similar to modern napalm. James R. Partington suggests in his book *A History of Greek Fire and Gunpowder* that it consisted of a mixture of "sulphur, pitch, dissolved nitre, and petroleum." The term "Greek fire" is a misnomer as the Byzantines called themselves Romans. The greatest revolution in the history of warfare, however, came with the introduction of gunpowder. According to Dr James B. Calvert, professor of engineering, "The fundamental inventions of gunpowder and cannon had been made by 1300, but the sources are rare, difficult to interpret, hard to date, and often contradictory. The best guess is that gunpowder followed quickly after saltpetre was discovered (that is, a process for its purification was developed) by Chinese alchemists around AD 900 and introduced to Europe via trade routes and travellers around AD 1225, and that cannon were invented in southern Europe just before AD 1300."

One of the problems in determining this accurately is that Chinese writers can be just as ethnocentric as Western ones,

sometimes more so. There is some debate whether gunpowder was invented independently in several regions, but most historians have settled for the explanation that it was first manufactured in China. Gunpowder (black powder) consists of charcoal, sulphur and potassium nitrate, or saltpeter, and was impossible to create until you could manufacture saltpeter with a high degree of purity. This was a specialty of Chinese alchemists quite early. The discovery reached the Middle East and Europe, probably via the Silk Road, and became known as "Chinese snow." Black powder remained the principle explosive until the nineteenth century, when the invention of unstable nitroglycerine made it possible for Swedish chemist Alfred Nobel to patent the more stable version of dynamite in 1867, and accumulate the great wealth which was later used to fund the various Nobel Prizes.

In the thirteenth century, the English Franciscan friar Roger Bacon, as well as the German Dominican friar Albertus Magnus, both theologians and scientists with an interest in alchemy, mention a recipe for gunpowder. The Mongol conquests spread the knowledge of the fire-lance, a gunpowder-filled tube made of bamboo which could fire various projectiles, across Eurasia. The development of this weapon stagnated in China proper. According to James B. Calvert, "The place and time of the invention of the cannon is unknown, but its evolution from the fire lance among the Turks, Arabs and Europeans can hardly be doubted. (.) The earliest use of cannon is not definitely known, but occurred sometime between 1300 and 1350. The use of cannon spread rapidly between 1350 and 1400."

Cannon were used during the Hundred Years' War between France and England, and Turkish Muslims successfully employed prolonged bombardment by massive Hungarian-made cannon during the conquest of Constantinople in 1453 to breach the walls of the city. Joel Mokyr, professor at the Department of Economics at Northwestern University and author of *The Gifts of Athena: Historical Origins of the Knowledge Economy*, writes about innovation and economic history. According to him (pdf), glass, although known in China, was not in wide use as tea was drunk in porcelain cups and the Chinese examined themselves in polished bronze mirrors. Islamic countries had a significant glass industry, yet they never came up with spectacles: "Tokugawa Japan had a flourishing industry making glass trinkets and ornaments, but no optical instruments emerged there either until the Meiji restoration [from 1867]. Not having access to the Hellenistic geometry that served not only Ptolemy and Alhazen, but also sixteenth century Italians such as Francesco Maurolico (1494-1575) who studied the characteristics of lenses, made the development of optics in the Orient difficult." The earliest known lenses were made of rock crystal, quartz, and other minerals, and have been used in Eastern and Western lands since ancient times. There is evidence that lenses were known in the Greco-Roman world. They have been used as burning glasses and magnifying glasses for centuries, and so-called reading stones were in common use during the Middle Ages, for instance the Visby lenses, lens-shaped rock crystals of high quality from in a Viking grave in Gotland, Sweden. The oldest one we know of is the Nimrud lens, found in modern Iraq. Estimated to be almost three thousand years old, it indicates that the ancient Assyrians did have some basic understanding of optics. Iraq, seat of the Sumerian, Akkadian and Assyrian kingdoms, is home to one of the world's oldest astronomical traditions. Babylonian astronomy greatly influenced many subsequent cultures, Middle Eastern, Greek and Indian, and the sexagesimal (based on the number sixty) numeral system of the Sumerians is still with us today, in the form of sixty minutes to the hour and 360 degrees in a circle.

The Iraqi-born scientist Ibn al-Haitham, known in the West as Alhacen or Alhazen, had a powerful influence on several Western scientists. Alhazen was a pioneer in the scientific method by basing hypothesis upon systematic observation. He is most commonly remembered for his great contributions in the field of optics, where he pondered the nature of light, speculated on the colors of the sunset and described the qualities of magnifying lenses. His eleventh century *Book of Optics* was translated into Latin during the late twelfth century, and left a significant impact on Roger Bacon and others in the thirteenth century.

Bacon was educated at Oxford and lectured on Aristotle at the University of Paris, the intellectual center among the small, but growing number of European universities. His teacher, the English bishop and scholar Robert Grosseteste, was a proponent of validating theory through experimentation. Roger Bacon wrote about many subjects, including optics, and was among the first persons to argue that lenses could be used for the correction of eyesight. He asserted that "philosophy is the special province of the unbelievers," and urged scholars to learn Arabic.

The Chinese experimented with lenses and mirrors, too, and produced a type of sunglasses, or eyeglasses with colored lenses. However, these appear to have been mainly for decorative purposes and possessed no corrective properties. The science of optics stagnated in China after initial advances. The first fully developed spectacles were made in Europe, in Northern Italy from the late thirteenth century onwards. The American scientist and inventor Benjamin Franklin invented bifocals in the eighteenth century, during the early years of the United States.

In 1572 Freidrich Risner printed some of Alhazen's work on optics, as well as a work by the thirteenth century Polish friar Witelo which was similar to it, and thus made Alhazen widely known to new generations of scholars. Notable among them was the German astronomer Johannes Kepler. Danish astronomer Tycho Brahe, who died in 1601, was perhaps the most meticulous astronomer of the pre-telescopic era. During the final year of his life, Brahe passed on his observations of Mars to Kepler. These precise notes were important for Kepler's work on planetary motion, but another breakthrough that could verify his thesis was soon to come.

As corrective lenses for near-sightedness became more sophisticated, the demand for high quality glass lenses grew. In the Netherlands in the seventeenth century, Baruch Spinoza could make a decent living as a skilled lens grinder while working on his philosophical theories. This was during the Dutch Golden Age when the country was a refuge for many groups suffering from religious persecution, for instance Huguenots (Protestants) from France. Spinoza descended from Jews who had been expelled from Spain and Portugal following the Reconquista. The production of spectacles opened up new arenas for optics. A Dutch eyeglass maker, Hans Lippershey, is said to have created the first practical telescope and made it publicly available in 1608.

Within a few months of the news, Italian scientist Galileo Galilei had made his own telescope, and became the first person to turn the new invention towards the sky, discovering the four major moons of Jupiter in 1610. Kepler developed the Galilean telescope further by 1611 and described the theoretical basis for telescopic optics, in part inspired by Alhazen's work. The telescope had traveled from the Netherlands via Italy to Kepler in Prague within three years of its invention and had been improved along the way, a remarkable pace of innovation and diffusion of knowledge. Sir Isaac Newton's *Principia Mathematica* from 1687 and his laws of motion and gravity were derived from, among other things, Galileo's telescopic observations and Kepler's Laws of Planetary Motion.

Dutch eyeglass maker Zacharias Janssen and his father Hans are usually credited with inventing the first microscope in the late 1500s. The microscope was improved in the seventeenth century by their countryman Antonie van Leeuwenhoek, who was the first to spot bacteria and thus opened up an entirely new field of microbiology. This in turn led to great advances in the natural sciences. The German physician Robert Koch and the French chemist Louis Pasteur founded the science of bacteriology in the nineteenth century. The understanding that disease is caused by bacteria and microscopic germs produced the greatest strides in medicine in history.

According to the free online encyclopaedia Wikipedia, reading stone lenses were invented by polymath Armen Firman (Abbas Ibn Firnas) in Córdoba in Islamic-occupied Spain in the ninth century, and later spread throughout Europe. Wikipedia embodies both the good and some of the problematic aspects of the Internet. I have found useful information there more than once, but it can also be notoriously unreliable on certain subjects due to its numerous editors and lack of professional oversight. Let's assume for a moment that this information is correct. If so, how come lenses weren't developed further by Muslims? The telescope and the microscope were by-products of advances in the production of glass lenses. They made possible, for the first time ever, the study of what is not visible to the naked human eye and radically altered our understanding of the universe, both in the realms of the very small and the very big. All of this could have happened in the Islamic world. So why didn't it, despite the fact that lenses were known there at least as early as in Europe, and despite the fact that the region produced a gifted optical scientist, Alhazen?

Alhazen personally should be credited with being one of the greatest scientists of his age in any discipline, Eastern or Western, yet his inquisitive attitude and scientific mindset wasn't always appreciated by his contemporaries. Here is how his writings were received by fellow Muslims, as quoted in Ibn Warraq's book *Why I Am Not a Muslim*: "A disciple of Maimonides, the Jewish philosopher, relates that he was in Baghdad on business, when the library of a certain philosopher (who died in 1214) was burned there. The preacher, who conducted the execution of the sentence, threw into the flames, with his own hands, an astronomical work of Ibn al-Haitham [Alhazen], after he had pointed to a delineation therein given of the sphere of the earth, as an unhappy symbol of impious Atheism."

Alhazen made numerous books, many of which are lost today. His groundbreaking *Book of Optics* survives to us in Latin translation. Muslims thus had access to ideas, but they failed to appreciate them and exploit their potential. This pattern was repeated on several occasions. The first windmills were probably made in Persia prior to the Islamic conquest in the seventh century. Windmills were introduced in Europe during the High Middle Ages, at least from the twelfth century onwards, and spread rapidly across Western Europe during a prolonged period of great improvements. Persian-style windmills spread from Central Asia to China following the Mongol conquest in the thirteenth century, yet in 1206 the leading Arab engineer of the day observed to his readers that the notion of driving mills by the wind was nonsense.

Sundials have been used in Egypt and other civilizations since prehistoric times. Water clocks, too, date from ancient times and had reached a certain level of complexity in the Greco-Roman world. The ancient Greeks created devices resembling clock-work, for instance the Antikythera mechanism (second century B.C.) which has been called a mechanical computer. Early clocks (though not fully developed) were made in Asia, especially China, and could have been known in the Middle East. Around the year 800, Caliph Harun al-Rashid from Baghdad presented Charlemagne with the gift of a complex water clock which struck the hours. In 850 the three Persians Banu Musa, as part of the translation efforts undertaken at the House of Wisdom in Baghdad, published *The Book of Ingenious Devices* describing many mechanical inventions developed by earlier cultures. They were interested in the work of Greek engineer Hero of Alexandria who made the first known steam-powered device. Again, there is plenty of evidence that Muslims had at their disposal both the theoretical knowledge and the practical examples necessary to create mechanical clocks.

Despite having access to much of the same knowledge as did Christian Europeans, Muslims didn't develop fully mechanical clocks. This happened in Europe in the thirteenth century. The invention spread rapidly throughout Italy, France and England. One was installed in the Old St Paul's Cathedral in London in 1286. The fourteenth century English author Geoffrey Chaucer mentioned a clock, apparently meaning one with a bell which struck the hour. Salisbury cathedral is thought to have the oldest functioning clock in existence, dating back to the year 1386. Clocks were initially large and were used to decorate public buildings. By the year 1500, the coiled spring had been invented, paving the way for smaller clocks. The first portable timepiece was created in Nuremberg, Germany by locksmith Peter Henlein in 1505 in the shape of a sphere worn as a jewel. Dutch scientist Christiaan Huygens, by employing Galileo's law of the pendulum, in 1656 made the first pendulum clock, which was much more accurate than previous models. He also invented the balance wheel and spring assembly underlying many modern watches. French mathematician Blaise Pascal is said to have made a wristwatch by attaching his portable clock to his wrist with a string.

I'm not suggesting that no scientific achievements were made in the Islamic world. Avicenna's *Canon of Medicine* was translated into Latin in the twelfth century, and as late as the sixteenth century, Vesalius wrote a thesis commenting on Rhazes. It is impossible to write the medical history of the West during this age without mentioning Middle Eastern physicians such as Avicenna and Rhazes. What I am suggesting is that the number of achievements steadily declined, and I'm not sure how much Islam should be credited with those achievements that were actually made.

Muslims failed to develop clocks and eyeglasses and were actively hostile to printing, yet immediately embraced gunpowder and firearms (though the development of the latter soon stagnated, too). I think this highly selective view of technology tells us something about their mentality: They didn't see the value in printing, but they liked gunpowder since it could be used to terrorize and intimidate non-Muslims. Infidel technology is primarily interesting if it can be used to blow up other infidels. Sadly, I'm not so sure Islamic mentality has changed significantly in the 800 years since then. During the past few decades, globalization, Muslim immigration to the West and the massive influx of petrodollars to Muslim nations with huge reserves of petroleum have enabled Muslims to acquire or buy technology they are unable to develop themselves. The result, along with a huge demographic increase in Muslims which is again caused by infidel advances in medicine, has been a tidal wave of Jihad sweeping across the world. The lesson for non-Muslims should be: If you provide Muslims with technology and know-how, this will not be used to create peaceful and prosperous societies; it will be used to kill or subjugate you.

As writer Bassam Tibi notes, Muslims today tend to view science as something that is separated from society, and believe they can adopt or appropriate modern science and technology but not the wider framework that goes with them.

I agree with Tibi. Muslims have no understanding of science as the basis of technological progress, and free speech and rational criticism of everything, including religious doctrines, as the basis of science. They talk about science as if it were a commodity, a television or a personal computer, something which Muslims "had" earlier, then "lost" or handed over to Westerners who "took" it from them. Hence, Muslims shouldn't feel grateful for anything infidel science provides them with, since science was really "theirs" in the first place and they're just taking back something which rightfully belongs to them. But science isn't a commodity; it is a method, a way of looking critically and rationally at the world.

In my view, this failure to see the connection between cause, science and a free society, and effect, technological progress, stems from a fundamental flaw in the Islamic way of looking at the universe: They see no connection between cause and effect because their entire religious world view is based on the notion that everything is subject to the whims of Allah, and that there is no predictable logic behind anything. As Hugh Fitzgerald frequently says, this resigned Inshallah-fatalism ("If Allah wills it, it will happen") greatly inhibits progress of any kind. The ultimate irony and tragedy is that Muslims move to infidel societies in order to enjoy the commodities and consumer goods produced there, yet immediately set out to destroy the conditions which created these advances in the first place, political freedom and manmade laws.

At least two conditions are necessary for the creation of a successful nation: The ability to produce talented individuals with great ideas, and the cultural and structural ability of society to recognize the full potential of these ideas and utilize them. The Islamic world, for a while, performed reasonably well at the former task, but failed miserably and consistently at the latter. Even if it could occasionally give birth to gifted individuals they tended to be unorthodox Muslims or, in the case of Rhazes, outright hostile to Islam. The frequency of thinkers of Avicenna's and certainly Alhazen's stature also steadily declined. This strongly indicates that "Islamic science" had little to do with Islam, but was the amalgam of pre-Islamic knowledge, Greek, Indian, Persian, Jewish, Assyrian Christian and other. As Muslims gradually became numerically dominant and Islamic orthodoxy more firmly established, this pre-Islamic heritage was slowly extinguished, hence science declined and never recovered. This failure was intimately linked to the Islam's hostility towards innovation and freethinking. In contrast, the Christian and Jewish religions proved more receptive towards new ideas. At the very least they were not as aggressively hostile to logic as was Islam, and in certain situations even facilitated it.

Europe did produce many talented individuals, yet what ultimately set it apart from the Islamic world, and even from non-Muslim Asians at this age, was the remarkable pace of diffusion of new ideas, home-grown or imported, and the speed with which further improvements were made once an idea had been introduced. This was due to a combination of factors: A successful marriage between Christian doctrines and the Greco-Roman heritage during the Middle Ages and the Renaissance, the ability to continuously generate new knowledge and put it into practical application through the accumulation of capital and a dynamic merchant class, an institutionalized framework for scholarly debate through universities with a significant degree of free enquiry, the adoption of printing, which made communication easier and facilitated the accumulation of ever-more accurate knowledge, and last, but not least, a higher degree of individualism and political liberty, which encouraged freethinking, a non-traditionalist outlook and by extension innovation.

Upon saying this, I must confess that I cannot say with a straight face that these are hallmarks of Europe today. We have always been told that there is a basic conflict between religion and reason, which would presumably mean that the less religious we become, the more rational we should become. Western Europe is currently less religious than we have ever been, yet I see no indication that we have become more reasonable because of this. We may not have a formal index of forbidden books, as did the Catholic Church for centuries, but we do have an informal index of forbidden topics which can be equally effective in suppressing free enquiry and stifling debate. This is now done in the name of tolerance and Multicultural diversity, not God, but the result is much the same. The end of religion, thus, didn't herald an age of reason; it led to a new age of secular superstition and new forms of witch-hunts. Bad things can be said about medieval Europeans, but at least they didn't import Muslims in large numbers and congratulate themselves for their tolerance. Secular Europeans do.

Andrew G. Bostom keeps referring to Julien Benda and his 1928 book *The Treason of the Intellectuals*, about how the abandonment of objective truths abetted totalitarian ideologies, which led to World War II. Bostom identifies a similar failure of Western intellectuals to acknowledge the history of Jihad today. From what I gather, Benda was a bit too anti-religious and anti-nationalist for my taste, but otherwise I agree: The problems faced by the West now in confronting Jihad have been facilitated by a failure of our education system, our media and indeed our entire society to uphold the ideal of critical thinking. If the rise of the West was linked to political liberty, rational thinking, free speech and universities championing free enquiry, the decline of the West can be linked to the decline of the same factors.

Author V.S. Naipaul thinks Islam is parasitical by nature and preys upon the pre-Islamic culture in the conquered lands. I will

add that it is also the kind of parasite which kills its host. I have no doubt that if Muslims should succeed in conquering Europe, this will in the future be hailed as a Golden Age of Islam. But it wouldn't be a Golden Age of Islam, it would be the twilight of Europe, just as the previous Golden Age was the twilight of the Christian, Jewish, Hindu, Zoroastrian and Buddhist cultures from North Africa to Central Asia, and the much vaunted accomplishments of "Islamic medieval science" were echoes of the heritage of Egyptians, Babylonians, Persians, Syrians and Greeks.

Yes, I know Mughal emperors could create magnificent architecture such as the Taj Mahal in India, but this was still a slave-state based upon the exploitation and persecution of non-Muslims. And yes, there can be rulers such as Akbar the Great, with his religious tolerance and imperial garden with thousands of cheetahs, but he was tolerant precisely because he was a Muslim in name only. Any such ruler will be succeeded by more pious Muslims, as was the case with Aurangzeb who reinstated the Jizya tax for infidels and destroyed Hindu temples. Anything good that happens in countries under Islamic rule generally happens in spite of Islam, not because of Islam, and the good parts will soon be reversed in the name of sharia. There will always be at least a dozen Aurangzeb to every Akbar.

We are currently witnessing major global shifts in power. In a macrohistorical perspective, China was the leading civilization a millennium ago but was surpassed by Europe. I firmly believe free speech and political liberty have long-term effects, and I'm not convinced China can keep up her economic progress unless she undertakes reforms. I'm also not convinced Europe's Islamization is inevitable, yet, but if present trends continue, maybe we will see a reversal of roles in the twenty-first century: China will prosper and Europe will disintegrate. In the meantime, however, when Muslims get their hands on Western technology and Europe's accumulated wealth, the world from Britain to Thailand could be plunged into a new age of Jihad.

<sup>1</sup> See [How Greek Science Passed to the Arabs](#)

*Fjordman is a blogger from Scandinavia. Visit his blog [here](#).*



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